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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/788,105	02/16/2001	Jay E. Uglow	LAM1P106D	2844

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EXAMINER

SUTTON, TIMOTHY J

ART UNIT	PAPER NUMBER
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2813

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8

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/788,105

Applicant(s)

UGLOW ET AL.

Examiner

Timothy J Sutton

Art Unit

2813

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 09 June 2002.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 21-24 and 26-41 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 21-24 and 26-41 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 16 February 2001 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____
- 4) ☐ Interview Summary (PTO-413) Paper No(s) _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

DETAILED ACTION

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in-

(1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effect under this subsection of a national application published under section 122(b) only if the international application designating the United States was published under Article 21(2)(a) of such treaty in the English language; or

(2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that a patent shall not be deemed filed in the United States for the purposes of this subsection based on the filing of an international application filed under the treaty defined in section 351(a).

2. Claims 21-24, 26-30, and 36-41 are rejected under 35 U.S.C. 102(e) as being anticipated by Yau et al. (U.S. 6,054,379).

Re claim 21, Yau et al. discloses a multi-layer dielectric layer over a substrate for use in dual-damascene applications, comprising: a barrier layer disposed over the substrate (column 1, lines 50-60; column 2, lines 30-40; and Figure 10h, Item 712); an inorganic dielectric layer disposed directly over the barrier layer (Figure 10h, Item 710); a low dielectric constant layer disposed directly over the inorganic dielectric layer (column 2, lines 55-67; column 3, lines 30-35; and Figure 10h, Item 722); wherein the low dielectric constant layer is configured to receive metallization line trenches and the inorganic dielectric layer is configured to receive vias during a dual damascene process (Figure 10h, item 724).

Re claim 22, the barrier layer is silicon nitride (Figure 10h, Item 712).

Re claim 23, the inorganic dielectric layer is a fluorine-doped oxide (called "FSG" for fluorinated silicate glass; Figure 10h, Item 710 & related text).

Re claim 24, the low dielectric constant layer is a carbon-doped oxide (column 2, lines 55-67; column 3, lines 30-35; and Figure 10h, Item 722).

Re claim 26, the inorganic dielectric layer has different material properties than the low dielectric constant layer at least because the dopants are different (column 2, lines 55-67 & column 3, lines 30-35).

Re claim 27, the thickness of the inorganic dielectric layer is about 4500 Angstroms (column 13, lines 30-40).

Re claim 28, the thickness of the low dielectric constant layer is about 5000 Angstroms (column 13, lines 12-16).

Re claim 29, the thickness of the low dielectric constant layer is greater than a thickness of the inorganic dielectric layer (column 13, lines 12-16 & 30-40).

Re claim 30, the thickness of the inorganic dielectric layer is about at least 1000 Angstroms, and the thickness of the low dielectric constant layer and the inorganic dielectric layer is about 10,000 Angstroms (column 13, lines 12-16 & 30-40).

Re claim 36, Yau et al. discloses a dielectric structure for dual-damascene applications, comprising: a barrier layer disposed over the substrate (column 1, lines 50-60; column 2, lines 30-40; and Figure 10h, Item 712); an inorganic dielectric layer of a fluorine doped oxide disposed directly over the barrier layer (Figure 10h, Item 710); a low dielectric constant layer of a carbon doped oxide disposed directly over the inorganic dielectric layer (column 2, lines 55-67; column 3, lines 30-35; and Figure 10h,

Item 722); wherein the low dielectric constant layer is configured to receive metallization line trenches and the inorganic dielectric layer is configured to receive vias during a dual damascene process (Figure 10h, item 724).

Re claim 37, the thickness of the inorganic dielectric layer of a fluorine-doped oxide is about 4500 Angstroms (column 13, lines 30-40).

Re claim 38, the thickness of the low dielectric constant layer is about 5000 Angstroms (column 13, lines 12-16).

Re claim 39, the thickness of the low dielectric constant layer is greater than a thickness of the inorganic dielectric layer (column 13, lines 12-16 & 30-40).

Re claim 40, the thickness of the inorganic dielectric layer of a fluorine doped oxide is about at least 1000 Angstroms, and the thickness of the low dielectric constant layer and a carbon doped oxide and the inorganic dielectric layer is about 10,000 Angstroms (column 13, lines 12-16 & 30-40).

Re claim 41, Yau et al. discloses a multi-layer dielectric layer over a substrate for use in dual-damascene applications, comprising: a barrier layer disposed over the substrate (column 1, lines 50-60; column 2, lines 30-40; and Figure 10h, Item 712); an inorganic dielectric layer of a fluorine doped oxide disposed directly over the barrier layer (Figure 10h, Item 710); a low dielectric constant layer of a carbon doped oxide disposed directly over the inorganic dielectric layer (column 2, lines 55-67; column 3, lines 30-35; and Figure 10h, Item 722); wherein the thickness of the inorganic dielectric layer of a fluorine doped oxide is about 4500 Angstroms (column 13, lines 12-16), and is configured to receive vias (Figure 10h, Item 724), and wherein a thickness of the low

dielectric constant layer of a carbon doped oxide is greater than the thickness of the inorganic dielectric layer of a fluorine doped oxide (column 13, lines 12-16 & 30-40) and is configured to receive metallization line trenches during a dual-damascene process (Figure 10h, Item 724).

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. Claims 31-36 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yau et al. (U.S. 6,054,379) in view of Wolf (Silicon Processing for the VLSI Era Volume 1 – Process Technology).

Re claim 31, Yau et al. discloses a multi-layer over a substrate for use in dual-damascene applications, comprising: a barrier layer disposed over the substrate (column 1, lines 50-60; column 2, lines 30-40; and Figure 10h, Item 712); an inorganic dielectric layer disposed over the barrier layer (Figure 10h Item 710); a low dielectric constant layer of a carbon doped oxide disposed directly over the inorganic dielectric layer (column 2, lines 55-67; column 3, lines 30-35; and Figure 10h, Item 722); wherein the low dielectric constant layer is configured to receive metallization line trenches and the inorganic dielectric layer is configured to receive vias during a dual damascene process (Figure 10h, item 724).

Yau et al. fails to teach that the inorganic dielectric layer is an un-doped TEOS oxide.

The basic textbook of Wolf teaches that undoped SiO_2 is formed inter alia by using TEOS (page 194, Table 4).

It would have been obvious to one with ordinary skill in the art to form SiO_2 using TEOS as taught in Wolf in the invention as taught by Yau et al. because (1) Yau et al. teaches that the first dielectric layer can be silicon dioxide and (2) Wolf teaches that TEOS is a notoriously well known precursor for forming undoped silicon dioxide.

Re claim 32, the thickness of the inorganic dielectric layer of an un-doped TEOS oxide is about 4500 Angstroms (column 13, lines 30-40).

Re claim 33, the thickness of the low dielectric constant layer is about 5000 Angstroms (column 13, lines 12-16).

Re claim 34, the thickness of the low dielectric constant layer of a carbon doped oxide is greater than a thickness of the inorganic dielectric layer of an un-doped TEOS oxide (column 13, lines 12-16 & 30-40).

Re claim 35, the thickness of the inorganic dielectric layer of an un-doped TEOS oxide is about at least 1000 Angstroms, and the thickness of the low dielectric constant layer of a carbon doped oxide and the inorganic dielectric layer of an un-doped TEOS oxide is about 10,000 Angstroms (column 13, lines 12-16 & 30-40).

Response to Arguments

5. Applicant's arguments with respect to claims 21-24 and 26-41 have been considered but are moot in view of the new ground(s) of rejection.

Conclusion


6. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. U.S. 6,211,063 relating to the fabrication of semiconductor structures, and more particularly, to a method to fabricate self aligned dual damascene structures in the manufacture of integrated circuits.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Timothy J Sutton whose telephone number is 703-305-0070. The examiner can normally be reached on M-F 8:30am-5:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Olik Chaudhuri can be reached on 703-306-2794. The fax phone numbers for the organization where this application or proceeding is assigned are 703-308-7722 for regular communications and 703-308-7722 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0956.

tjs
July 22, 2002


OLIK CHAUDHURI
SUPERVISORY PATENT EXAMINER
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